Infectious Disease—A Threat to Global Health and Security

Two months ago the White House adopted a new national public health policy for dealing with ominous threats of emerging and reemerging infections. The policy was based on a report called *Infectious Disease—A Global Health Threat,* released in September 1995.[1] The policy was initiated by the National Science and Technology Council (NSTC) and is known as NSTC-7.

The threats posed by infectious disease have engaged public concern via the media, the cinema, and many serious books and advisory pronouncements during the last several years,[2-6] as well as a new journal, *Emerging Infectious Diseases,* published quarterly by the Centers for Disease Control and Prevention (CDC).[7] The January 17, 1996, issue of *JAMA* was a theme issue on the same topic, in cooperation with 35 other medical journals around the world.[8]

Last month's headline was BSE (bovine spongiform encephalitis). As we go to press, this month belongs to *Cyclospora* (a protozoan once misclassified as a blue-green alga) possibly spread via fresh fruits—unless some other matter even deadlier overtakes it.[9]

The report was prepared during many months of deliberation by the Committee on International Science, Engineering, and Technology (CISET). The NSTC is the parent body of CISET. Chaired by Vice President Al Gore and coordinated by the president's science adviser, John Gibbons, MD, the NSTC is the principal avenue of coordination and conciliation of the many turfdoms involved in health-related policies, especially where international issues are also embraced. At least 6 cabinet departments (agriculture, commerce, defense, health and human services, state, and veterans affairs) and as many more independent agencies, including the Environmental Protection Agency, the National Aeronautical and Space Administration, the Office of Management and Budget, and the US Agency for International Development were actively involved in the NSTC initiative. It is necessary to invoke this bureaucratese to illustrate how difficult it is to achieve that coordination—and the more so when international commitments are increasingly problematical and when the domestic health policy debate is saturated by contention over the size, allocation, and access relating to the health care services pie.

For such a document to be promulgated at all—let alone made into national policy—is a notable achievement. Vice President Gore made an insightful and inspiring presentation of the CISET report and resulting national policy, NSTC-7, at a conference in Washington, DC, of the National Council for International Health, and he is to be congratulated for his leadership in bringing the report to the public. Wanting is a comparable endorsement of what should be a compellingly nonpartisan issue on the part of a Republican Congress. For in this election year, there is the peril that the very initiative to settle the turf battles within the executive branch will evoke a reflex deprecation from the legislative branch. Such a counterproductive reflex can only be countered by a well-grounded professional and public understanding and expression that world public health is everyone's concern and that NSTC-7 offers the highest payoff for investment on behalf of our national and personal security against the spread of deadly communicable disease. Today's scourge of HIV, the periodic outbreaks of emerging and reemerging infections, and the grim realties of drug-resistant tuberculosis and of many nosocomial infections are irrefutable instantiations of those threats. (See Tables 1 and 2.)

Why, the CISET report asks, "are infectious diseases reemerging as major threats to human health?" With my own selective emphasis, I quote population growth, demographic stratification, and unprecedented travel and other movements of populations as positioning us in a historically unique station of human ecology.[10] Others would give equal or greater weight to "Nature's revenge," for our intrusion into forests, irrigation projects, and climate change. Behavioral change (or immutability) facilitates sexual transmission (eg, of HIV), compounded by intravenous drug abuse. Complacency has led to neglect of vaccination, abuse and overuse of antibiotics, and the deterio-

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Table 1.—Examples of Pathogenic Microbes and Infectious Diseases Recognized Since 1973*

Year	Microbe	Type	Disease
1973	Rotavirus	Virus	Major cause of infantile diarrhea worldwide
1975	Parvovirus B19	Virus	Aplastic crisis in chronic hemolytic anemia
1976	*Cryptosporidium parvum*	Parasite	Acute and chronic diarrhea
1977	Ebola virus	Virus	Ebola hemorrhagic fever
1977	*Legionella pneumophila*	Bacteria	Legionnaires disease
1977	Hantaan virus	Virus	Hemorrhagic fever with renal syndrome (HRFS)
1977	*Campylobacter jejuni*	Bacteria	Enteric pathogens distributed globally
1980	Human T-lympho-tropic virus I (HTLV-1)	Virus	T-cell lymphoma/leukemia
1981	Toxic producing strains of *Staphylococcus aureus*	Bacteria	Toxic shock syndrome (tampon use)
1982	*Escherichia coli* O157:H7	Bacteria	Hemorrhagic colitis; hemolytic uremic syndrome
1982	HTLV-II	Virus	Hairy cell leukemia
1982	*Borrelia burgdorferi*	Bacteria	Lyme disease
1983	Human immunodeficiency virus (HIV)	Virus	Acquired immunodeficiency syndrome (AIDS)
1983	*Helicobacter pylori*	Bacteria	Peptic ulcer disease
1985	*Enterocytozoon bieneusi*	Parasite	Persistent diarrhea
1986	*Cyclospora cayetanensis*	Parasite	Persistent diarrhea
1988	Human herpesvirus 6 (HHV-6)	Virus	Roseola subitum
1988	Hepatitis E	Virus	Enterically transmitted non-A, non-B hepatitis
1989	*Ehrlichia chafeensis*	Bacteria	Human ehrlichiosis
1989	Hepatitis C	Virus	Parenterally transmitted non-A, non-B liver infection
1991	Guanarito virus	Virus	Venezuelan hemorrhagic fever
1991	*Encephalitozoon hellem*	Parasite	Conjunctivitis, disseminated disease
1991	New species of *Babesia*	Parasite	Atypical babesiosis
1992	*Vibrio cholerae* O139	Bacteria	New strain associated with epidemic cholera
1992	*Bartonella henselae*	Bacteria	Cat-scratch disease; bacillary angiomatosis
1993	Sin nombre virus	Virus	Adult respiratory distress syndrome
1993	*Encephalitozoon cuniculi*	Parasite	Disseminated disease
1994	Sabia virus	Virus	Brazilian hemorrhagic fever
1995	HHV-8	Virus	Associated with Kaposi sarcoma in AIDS patients

*Reprinted from NSTC-CISET Working Group on Emerging and Re-emerging Infectious Diseases.[1]

Table 2.—Reemerging Infections During the Last 2 Decades and Factors Contributing to Their Reemergence*

Disease or Agent	Factors in Reemergence
	Viral
Rabies	Breakdown in public health measures; changes in land use; travel
Dengue/dengue hemorrhagic fever	Transportation, travel and migration, urbanization
Yellow fever	Favorable conditions for mosquito vector
	Parasitic
Malaria	Drug and insecticide resistance; civil strife; lack of economic resources
Schistosomiasis	Dam construction, improved irrigation, and ecological changes favoring the snail host
Neurocysticercosis	Immigration
Acanthamebiasis	Introduction of soft contact lenses
Visceral leishmaniasis	War, population displacement, immigration, habitat changes favorable to the insect vector, and increase in immunocompromised human hosts
Toxoplasmosis	Increase in immunocompromised human hosts
Giardiasis	Increased use of child-care facilities
Echinococcosis	Ecological changes that affect the habitats of the intermediate (animal) hosts
	Bacterial
Group A *Streptococcus*	Uncertain
Trench fever	Breakdown of public health measures
Plague	Economic development; land use
Diphtheria	Interruption of immunization program due to political changes
Tuberculosis	Human demographics and behavior; industry and technology; international commerce and travel; breakdown of public health measures; microbial adaptation
Pertussis	Refusal to vaccinate in some parts of the world because of the belief that injections or vaccines are not safe
Salmonella	Industry and technology; human demographics and behavior; microbial adaptation; food changes
Pneumococcus	Human demographics; microbial adaptation; international travel and commerce; misuse and overuse of antibiotics
Cholera	Travel: a new strain (O139) apparently introduced to South America from Asia by ship, with spread facilitated by reduced water chlorination and also food

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ration of public health infrastructure, or its diversion to special needs like HIV infection without compensation for the core.

Above all, we face an ever-evolving adversary: microbes a billionfold more numerous than ourselves, vested with high intrinsic mutability and replication times measured in minutes, not years. Within every infected person, we see a Darwinian struggle mobilizing the genetic diversity of our immune cells to respond to unpredictable invaders. Our survival as a species is testimony to the efficiency of that machinery. But many microbes have learned their own tricks of jamming or coming in under the radar scan, masking their antigens, or simply multiplying faster than our immune system can respond. For these, a strategy of mutual attrition, or evolutionary competition, is doomed. Pitted against microbial genes, we have mainly our wits.

The main responses institutionalized in the CISET report and NSTC-7 concern global surveillance: the intelligence function for security against infection. That surveillance will include closer scrutiny of "persons, animals or material" traversing our ports and providing travelers with information and guidance about disease that may have been acquired abroad. Such efforts are commendable, but cannot offer much assurance with diseases whose incubation time exceeds that of air travel.

Surveillance needs repair domestically as well. Public health departments and other professionals in country can be sensitized to look out for exotic syndromes, and the legal basis for their cooperation can be enforced. At present, "none of the US agencies has a clear mandate to respond to epidemics outside our borders, and no executive structure exists either to oversee international disease surveillance or to mobilize a response when the outbreak occurs." The vice president's announcement provided assurance that the CDC would be given that authority and supported CISET's appeal for an interagency task force to provide that coordination.

After intelligence and warning, then what? The CISET report addresses the shortfalls in resources and in technical capability to respond to emergencies, particularly in facing massive outbreaks that would require substantial outlays in medical personnel, diagnostic facilities, drugs and vaccines—not to mention logistic support for global occurrences. In the best of times, the United States could not unilaterally provide health care for the world; but even under current budget stringency the United States is the main point of leadership in the intergovernmental health community. This leadership potential is all too often frustrated by petty political squabbles and related troubles afflicting the credibility of most of the

United Nations system that makes firm leadership from the US government and bodies like the World Bank all the more crucial. The executive branch, thanks to NSTC-7, can at least speak with a single voice, affirming our self-interested responsibility for global health through national security.

Last but not least is the foundation of training and research. As part of our complacency, infectious disease has fallen behind heart disease and cancer in priorities at the National Institutes of Health and other granting bodies. In particular, the authority and appropriations to act internationally have long been severely limited. For decades, the medical laboratories of the US Army have been the principal seat of research on exotic diseases like malaria—and this is attenuated by the downsizing of the military since the end of the cold war, indeed as a byproduct of the overall decolonialization of the world's polity since World War II. Several well-intentioned proposals have called for the removal of that responsibility from the army to the civilian sector, but that would result in even further decay for exotic disease research.

The CISET report does acknowledge the indispensable part of the private pharmaceutical industry, and Vice President Gore made particular reference to public-private partnerships. The report does not, however, address the core problems of how to finance investment for products that most of the world is too poor to buy, in a risk and regulatory climate where private investment into research and development can only be justified when large margins are anticipated for technical successes. We are already experiencing a market failure marring the industry's spectacular history until now in antibiotic innovation for the domestic market. Witness the desperation with which we face the prospect of loss to resistance on the part of vancomycin, currently the antibiotic of last resort for gram-positive cocci.[11]

Finally, to paraphrase a caveat from the Office of Management and Budget: We don't promise any money. Nevertheless, the White House announced that an augmentation of $27 million, to now reach $45 million for CDC's domestic network on emerging infections would be in the executive budget for the 1997 fiscal year, beginning October 1, 1996.

In sum, these are important and inspiriting doctrinal steps, a recognition that this aspect of public health (so long ignored) is worthy of top-level policy attention. In the current budgetary climate, any new allocation is remarkable. But nothing will happen unless there is comparable interest and attention from the legislative side, which is bedeviled by many weightier matters in sharp controversy in health, as with innumerable other issues. Senator Kassebaum's retirement from the upper house is a loss of a likely advocate. The CDC itself has enhanced its unpopularity in some quarters with its campaigns to limit the spread of AIDS, tobacco-related disease, and gun-related violence. Public health generally may be thought of as service to the poor—and well it might—but the stakes are shared by everyone. There are great psychological impediments to get people to think about protecting their well-being while they are still healthy and building this into political and social institutions. Further progress will depend very much on "doctors" recalling and embracing the historic root of that term as docents, ie, teachers.

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